

WHAT IS CLAIMED IS:

- 1       1. A power train, comprising:
  - 2           an output member rotatable about a predetermined
  - 3           axis;
  - 4           a rotary input member; and
  - 5           means for transmitting torque between said input
  - 6           and output members, including
    - 7               an engageable and disengageable friction
    - 8               clutch having a housing rotatable with said output
    - 9               member about said axis,
    - 10              a rotary clutch disc arranged to rotate with
    - 11             said input member, and
    - 12              means for selectively coupling said clutch
    - 13             disc to said housing, including at least one cylin-
    - 14             der and piston unit having at least one cylinder
    - 15             mounted on said housing in a fixed position, as seen
    - 16             in the direction of said axis, and rotatable with
    - 17             reference to said housing.

1           2. The power train of claim 1, wherein said at  
2 least one cylinder is rotatable about said predetermined  
3 axis.

1           3. The power train of claim 1, wherein said at  
2 least one unit further comprises an annular piston reci-  
3 procable in said at least one cylinder.

1           4. The power train of claim 1, wherein said means  
2 for selectively coupling comprises a plurality of cylinder  
3 and piston units each having a cylinder mounted on said  
4 housing in a fixed position, as seen in the direction of  
5 said axis, and rotatable with reference to said housing,  
6 said cylinders being spaced apart from each other in a cir-  
7 cumferential direction of said housing.

1           5. The power train of claim 4, further comprising  
2 a support rotatably mounted on said housing and arranged  
3 to carry said cylinders of said plurality of cylinder and  
4 piston units.

1           6. The power train of claim 4, wherein said clutch  
2 further comprises a pressure plate reciprocable in said  
3 housing relative to said housing and a clutch spring  
4 arranged to bias said pressure plate against said clutch  
5 disc in the engaged condition of said clutch, each of said  
6 units further having a piston reciprocable in the respect-  
7 ive cylinder in the direction of said axis relative to said  
8 clutch spring, and said clutch further having a disengaging  
9 bearing interposed between said pistons and said clutch  
0 spring.

1           7. The power train of claim 1, wherein said at  
2 least one cylinder is coaxial with said housing and is  
3 rotatable relative to said housing about said axis, said  
4 torque transmitting means further including an antifriction  
5 bearing interposed between said housing and said at least  
6 one cylinder.

1           8. The power train of claim 1, further comprising  
2        a first bearing interposed between said housing and said  
3        at least one cylinder, said at least one unit further com-  
4        prising a piston reciprocable in said at least one cylinder  
5        and a second bearing interposed between said piston and  
6        a resilient element of said clutch, said resilient element  
7        being arranged to bias a pressure plate of said clutch  
8        against said clutch disc in the engaged condition of said  
9        clutch.

1           9. The power train of claim 8, wherein said  
2        bearings spacedly surround said axis, said first bearing  
3        being disposed at a first radial distance from said axis  
4        and said second bearing being disposed at a second radial  
5        distance from said axis.

1           10. The power train of claim 9, wherein said first dis-  
2        tance at least approximates said second distance.

1           11. The power train of claim 9, wherein one of said  
2        bearings surrounds the other of said bearings.

1           12. The power train of claim 9, wherein said  
2 bearings are disposed at at least substantially identical  
3 distances from said output member as seen in the direction  
4 of said axis.

1           13. The power train of claim 1, wherein said means  
2 for selectively coupling said clutch disc to said housing  
3 further includes two pressure plates disposed in and rotat-  
4 able with said housing and flanking said clutch disc, said  
5 housing including a wall surrounding said pressure plates  
6 and said at least one cylinder and piston unit further  
7 having a piston movable in said at least one cylinder to  
8 at least one position in which one of said pressure plates  
9 urges said clutch disc into frictional engagement with the  
10 other of said pressure plates.

1           14. The power train of claim 1, wherein at least  
2 a portion of said housing consists of sheet metal.

1           15. The power train of claim 14, wherein said  
2 portion of said housing is a converted blank.

1           16. The power train of claim 1, wherein said  
2 housing includes an annular portion nearest to and  
3 surrounding said axis, said means for selectively coupling  
4 further including a bearing centered by said annular por-  
5 tion.

1           17. The power train of claim 16, wherein said  
2 bearing surrounds said annular portion of said housing.

1           18. The power train of claim 1, wherein said  
2 housing of said clutch includes a flywheel and a cover  
3 having a radially outer portion remote from said axis and  
4 affixed to said flywheel and a radially inner portion  
5 adjacent to but spaced apart from and surrounding said  
6 axis, said clutch further having at least one component  
7 disposed in said housing between said flywheel and said  
8 cover as seen in the direction of said axis.

1           19. The power train of claim 1, further comprising  
2 means for separably coupling said at least one cylinder  
3 with said housing.

1           20. The power train of claim 1, further comprising  
2 an antifriction bearing between said at least one cylinder  
3 and said housing, and means for separably coupling said  
4 bearing with said housing of said friction clutch.

1           21. The power train of claim 20, wherein said  
2 bearing has an outer race and said coupling means is ar-  
3 ranged to separably connect said housing with said outer  
4 race.

1           22. The power train of claim 20, wherein said  
2 coupling means is selected from the group consisting of  
3 a bayonet lock, a snap fastener and a detent.

1           23. The power train of claim 1, wherein at least  
2 a portion of said at least one cylinder consists of a  
3 plastic material.

1           24. The power train of claim 1, wherein said at  
2 least one cylinder is of one piece.

1           25. The power train of claim 1, wherein said at  
2 least one cylinder is an injection molded part.

1           26. The power train of claim 1, further comprising  
2 at least one fixed component, said at least one cylinder  
3 being arranged to bear upon said at least one fixed  
4 component while receiving torque from one of said input  
5 and output members.

1           27. The power train of claim 26, further comprising  
2 a variable-speed transmission having an input shaft  
3 including said rotary input member, said transmission  
4 further comprising a stationary case and said fixed  
5 component forming part of said case.

1           28. The power train of claim 26, wherein said at  
2 least one cylinder and piston unit is a fluid-operated  
3 unit and further comprising means for supplying fluid to  
4 said at least one cylinder and piston unit including a  
5 conduit for pressurized fluid, said at least one fixed com-  
6 ponent forming part of said conduit.

1           29. The power train of claim 26, further comprising  
2        a variable-speed transmission having an input shaft  
3        including said rotary input member and a stationary case,  
4        said at least one fixed component including at least one  
5        projection extending in at least substantial parallelism  
6        with said axis, connected with one of said case and said  
7        at least one cylinder and arranged to abut a stop of the  
8        other of said case and said at least one cylinder.

1           30. The power train of claim 1, wherein said at  
2        least one cylinder and piston unit further includes a  
3        piston reciprocable in said at least one cylinder in the  
4        direction of said axis to thereby change the condition of  
5        said clutch, said at least one cylinder having a stop ar-  
6        ranged to limit the extent of movability of said piston  
7        in the direction of said axis.

1           31. The power train of claim 1, further comprising  
2        a first bearing interposed between said at least one  
3        cylinder and a clutch release bearing between a piston of  
4        said at least one unit and an energy storing element of  
5        said clutch, said first bearing being disposed between said  
6        clutch disc and said release bearing as seen in the direc-  
7        tion of said axis.

1           32. The power train of claim 1, wherein said clutch  
2 is subject to wear in response to repeated engagement and  
3 disengagement thereof, and further comprising means for  
4 automatically compensating for said wear.

1           33. The power train of claim 1, wherein said clutch  
2 is a push type clutch.

1           34. The power train of claim 1, wherein said at  
2 least one cylinder and piston unit is a fluid-operated unit  
3 and further comprising means for automatically supplying  
4 fluid to said at least one unit.

1           35. The power train of claim 34, wherein said means  
2 for automatically supplying fluid to said at least one unit  
3 includes a master cylinder.

1           36. The power train of claim 1, further comprising  
2 means for transmitting torque between said output member  
3 and said housing including a wall flexible in the direction  
4 of said axis.

1           37. The power train of claim 1, further comprising  
2 means for coupling said input member with said clutch disc  
3 and means for separably connecting said housing to said  
4 output member so that said clutch disc can remain coupled  
5 to said input member prior, during and upon separation of  
6 said housing from said output member.

1           38. The power train of claim 37, wherein said input  
2 member forms part of a change-speed transmission.

1           39. The power train of claim 1, further comprising  
2 a pilot bearing between a prime mover including said output  
3 member and said clutch.

1           40. The power train of claim 1, further comprising  
2 a pilot bearing between a prime mover including said output  
3 member and a driven assembly including said input member.

1           41. The power train of claim 1, further comprising  
2 a pilot bearing rotatably journalling one of said input  
3 and output members in the other of said input and output  
4 members.

1           42. A power train, comprising:  
2                 a prime mover having an output member rotatable  
3             about a predetermined axis;  
4                 a driven unit including a rotary input member  
5             coaxial with said output member; and  
6                 an engageable and disengageable friction clutch  
7             arranged to transmit torque between said input and output  
8             members and including  
9                         a housing rotatable with said output member  
10            about said axis,  
11                 a clutch disc disposed in said housing and  
12            affixed to said input member,  
13                 a pressure plate movable in the direction  
14            of said axis and arranged to rotate with and dispos-  
15           ed in said housing,  
16                 an energy storing device disposed in said  
17            housing and operable to bias said pressure plate  
18           against said clutch disc to thus engage the clutch  
19           and establish a torque transmitting connection bet-  
20           ween said input and output members, and  
21                 means for engaging said clutch including an  
22           actor rotatable with and axially fixed relative to  
23           said housing, said actor including means for moving  
24           said energy storing device relative to said housing.

1           43. The power train of claim 42, wherein said  
2 clutch engaging means further includes a bearing interposed  
3 between said actor and said energy storing device.

1           44. The power train of claim 42, wherein said actor  
2 is an electrically operated actor.

1           45. The power train of claim 42, wherein said actor  
2 is a mechanically operated actor.

1           46. The power train of claim 45, wherein said actor  
2 is coaxial with said input and output members.

1           47. The power train of claim 42, wherein said  
2 clutch disc and said pressure plate are subject to wear  
3 in response to repeated engagement and disengagement of said  
4 clutch, and further comprising means for automatically com-  
5 pensating for said wear including means for moving said  
6 energy storing device relative to said housing.

1           48. The power train of claim 42, wherein said prime  
2 mover is the engine of a motor vehicle and said driven unit  
3 further includes a change-speed transmission.

1           49. The power train of claim 42, wherein said  
2 clutch disc includes friction linings engageable by said  
3 pressure plate and a torsional vibration damper between  
4 said friction linings and said input member.

1           50. The power train of claim 42, wherein said  
2 energy storing device includes a diaphragm spring and said  
3 clutch further comprises a counterpressure plate forming  
4 part of said housing, said clutch disc being disposed  
5 between said pressure plate and said counterpressure plate  
6 as seen in the direction of said axis.